

What is claimed is:

1. A reduced size GPS microstrip antenna comprising:
 - (a) a first dielectric substrate;
 - (b) a second dielectric substrate mounted on an upper surface of said first dielectric substrate;
 - (c) a ground plane mounted on a bottom surface of said first dielectric substrate;
 - (d) a shaped layer of etched copper mounted on an upper surface of said second dielectric substrate;
 - (e) first and second rectangular shaped quarter-wavelength microstrip antennas mounted on said upper surface of said second dielectric substrate, said first and second quarter-wavelength microstrip antennas being spaced apart from and electrically separated from said ground plane by said first and second dielectric substrates, said first and second quarter-wavelength microstrip antennas being adapted to receive an RF carrier signal containing GPS (Global Positioning System) data;
 - (f) said first quarter-wavelength microstrip antenna

20 being rotated ninety degrees with respect to said
21 second quarter-wavelength microstrip antenna on the
22 upper surface of said dielectric substrate;

23 (g) a feed network mounted on the upper surface of said
24 first dielectric substrate, said feed network having
25 one end of a first feed line and one end of a second
26 feed line connected thereto, said first feed line
27 having an opposite end thereof connected to said
28 first quarter-wavelength microstrip antenna, said
29 second feed line having an opposite end thereof
30 connected to said second quarter-wavelength
31 microstrip antenna, said first and second feed lines
32 forming a power divider which provides for a phase
33 shift of 90° of an electrical equivalent signal of
34 said RF carrier signal when transmitted through said
35 first and second feed lines; and

36 (h) said phase shift of said electrical equivalent signal
37 and said first quarter-wavelength microstrip antenna
38 being rotated ninety degrees with respect to said
39 second quarter-wavelength microstrip antenna,

40 providing for a circular polarization of said GPS
41 microstrip antenna.

1 2. The reduced size GPS microstrip antenna of claim 1
2 wherein each of said first and second shaped quarter-wavelength
3 microstrip antennas has an overall length of 0.750 inches and
4 an overall width of 0.650 inches.

1 3. The reduced size GPS microstrip antenna of claim 1
2 wherein each of said first and second quarter-wavelength
3 microstrip antennas is connected to said ground plane by a
4 plurality of copper plated through holes passing through said
5 first and second dielectric substrates.

1 4. The reduced size GPS microstrip antenna of claim 1
2 wherein each of said first and second quarter-wavelength
3 microstrip antennas includes a copper feed which passes through
4 said second dielectric substrate and connects said first feed
5 line to said first quarter-wavelength microstrip antenna and

6 said second feed line to said second quarter-wavelength
7 microstrip antenna.

1 5. The reduced size GPS microstrip antenna of claim 1
2 wherein said reduced size microstrip antennas has a center
3 frequency of 1.575 GHz and a frequency bandwidth of twenty
4 megahertz.

1 6. The reduced size GPS microstrip antenna of claim 5
2 wherein each of said first and second quarter-wavelength
3 microstrip antennas includes a tuning tab for fine tuning the
4 center frequency for said GPS microstrip antenna.

1 7. The reduced size GPS microstrip antenna of claim 1
2 wherein each of said first and second dielectric substrates has
3 a thickness of approximately .046 inches.

1 8. A reduced size GPS microstrip antenna comprising:
2 (a) a first conical wedge shaped dielectric substrate;
3 (b) a second conical wedge shaped dielectric substrate

4 mounted on an upper surface of said first dielectric
5 substrate;

6 (c) a ground plane mounted on a bottom surface of said
7 first dielectric substrate;

8 (d) a conical wedge shaped layer of etched copper mounted
9 on an upper surface of said second dielectric
10 substrate;

11 (e) first and second rectangular shaped quarter-
12 wavelength microstrip antennas mounted on said upper
13 surface of said second dielectric substrate, said
14 first and second quarter-wavelength microstrip
15 antennas being spaced apart from and electrically
16 separated from said ground plane by said first and
17 second dielectric substrates, said first and second
18 quarter-wavelength microstrip antennas being adapted
19 to receive an RF carrier signal containing GPS
20 (Global Positioning System) data;

21 (f) said first quarter-wavelength microstrip antenna
22 being rotated ninety degrees with respect to said
23 second quarter-wavelength microstrip antenna on the
24 upper surface of said dielectric substrate;

- (g) a feed network mounted on the upper surface of said first dielectric substrate, said feed network having one end of a first feed line and one end of a second feed line connected thereto, said first feed line having an opposite end thereof connected to said first quarter-wavelength microstrip antenna, said second feed line having an opposite end thereof connected to said second quarter-wavelength microstrip antenna, said first and second feed lines forming a power divider which provides for a phase shift of 90° of an electrical equivalent signal of said RF carrier signal when transmitted through said first and second feed lines;
- (h) said phase shift of said electrical equivalent signal and said first quarter-wavelength microstrip antenna being rotated ninety degrees with respect to said second quarter-wavelength microstrip antenna, providing for a circular polarization of said GPS microstrip antenna;
- (i) each of said first and second quarter-wavelength

45 microstrip antennas including a tuning tab for fine
46 tuning a center frequency for said GPS microstrip
47 antenna, said center frequency for said GPS
48 microstrip antenna being approximately 1.575 GHz; and
49 (j) a first three-sided gap position around three sides
50 of said first rectangular shaped quarter-wavelength
51 microstrip antenna and a second three-sided gap
52 position around three sides of said second
53 rectangular shaped quarter-wavelength microstrip
54 antenna, wherein an electromagnetic radiation pattern
55 for said GPS microstrip antenna emanates from said
56 first three-sided gap and said second three-sided
57 gap.

1 9. The reduced size GPS microstrip antenna of claim 8
2 wherein said first three-sided gap and said second three-sided
3 gap each have a width of 0.050 inches exposing about 0.050
4 inches of the upper surface of said second dielectric substrate
5 in alignment with said first three-sided gap and said second
6 three-sided gap.

1 10. The reduced size GPS microstrip antenna of claim 8
2 wherein each of said first and second shaped quarter-wavelength
3 microstrip antennas has an overall length of 0.750 inches and
4 an overall width of 0.650 inches.

1 11. The reduced size GPS microstrip antenna of claim 8
2 wherein each of said first and second quarter-wavelength
3 microstrip antennas is connected to said ground plane by a
4 plurality of copper plated through holes passing through said
5 first and second dielectric substrates.

1 12. The reduced size GPS microstrip antenna of claim 11
2 wherein said plurality of copper plated through holes comprises
3 eighteen copper plated through holes.

1 13. The reduced size GPS microstrip antenna of claim 8
2 wherein each of said first and second quarter-wavelength
3 microstrip antennas includes a copper feed which passes through
4 said second dielectric substrate and connects said first feed
5 line to said first quarter-wavelength microstrip antenna and

6 said second feed line to said second quarter-wavelength
7 microstrip antenna.

1 14. The reduced size GPS microstrip antenna of claim 8
2 wherein each of said first and second dielectric substrates has
3 a thickness of approximately .046 inches.

1 15. A reduced size GPS microstrip antenna comprising:
2 (a) a first conical wedge shaped dielectric substrate;
3 (b) a second conical wedge shaped dielectric substrate
4 mounted on an upper surface of said first dielectric
5 substrate;
6 (c) a ground plane mounted on a bottom surface of said
7 first dielectric substrate;
8 (d) a conical wedge shaped layer of etched copper mounted
9 on an upper surface of said second dielectric
10 substrate;
11 (e) first and second rectangular shaped quarter-
12 wavelength microstrip antennas mounted on said upper
13 surface of said second dielectric substrate, said

14 first and second quarter-wavelength microstrip
15 antennas being spaced apart from and electrically
16 separated from said ground plane by said first and
17 second dielectric substrates, said first and second
18 quarter-wavelength microstrip antennas being adapted
19 to receive an RF carrier signal containing GPS
20 (Global Positioning System) data, each of said first
21 and second quarter-wavelength microstrip antennas
22 being connected to said ground plane by a plurality
23 of copper plated through holes passing through said
24 first and second dielectric substrates;

- 25 (f) said first quarter-wavelength microstrip antenna
26 being rotated ninety degrees with respect to said
27 second quarter-wavelength microstrip antenna on the
28 upper surface of said dielectric substrate;
- 29 (g) a feed network mounted on the upper surface of said
30 first dielectric substrate, said feed network having
31 one end of a first feed line and one end of a second
32 feed line connected thereto, said first feed line
33 having an opposite end thereof connected to said
34 first quarter-wavelength microstrip antenna, said

35 second feed line having an opposite end thereof
36 connected to said second quarter-wavelength
37 microstrip antenna, said first and second feed lines
38 forming a power divider which provides for a phase
39 shift of 90° of an electrical equivalent signal of
40 said RF carrier signal when transmitted through said
41 first and second feed lines;

42 (h) said phase shift of said electrical equivalent signal
43 and said first quarter-wavelength microstrip antenna
44 being rotated ninety degrees with respect to said
45 second quarter-wavelength microstrip antenna,
46 providing for a circular polarization of said GPS
47 microstrip antenna;

48 (i) each of said first and second quarter-wavelength
49 microstrip antennas including a tuning tab for fine
50 tuning a center frequency for said GPS microstrip
51 antenna, said center frequency for said GPS
52 microstrip antenna being approximately 1.575 GHz;

53 (j) each of said first and second quarter-wavelength
54 microstrip antennas including a copper feed which
55 passes through said second dielectric substrate and

56 connects said first feed line to said first quarter-
57 wavelength microstrip antenna and said second feed
58 line to said second quarter-wavelength microstrip
59 antenna;

60 (k) a first three-sided gap position around three sides
61 of said first rectangular shaped quarter-wavelength
62 microstrip antenna and a second three-sided gap
63 position around three sides of said second
64 rectangular shaped quarter-wavelength microstrip
65 antenna, wherein an electromagnetic radiation pattern
66 for said GPS microstrip antenna emanates from said
67 first three-sided gap and said second three-sided
68 gap; and

69 (l) said GPS microstrip antenna having a frequency
70 bandwidth of twenty megahertz.

1 16. The reduced size GPS microstrip antenna of claim 15
2 wherein said first three-sided gap and said second three-sided
3 gap each have a width of 0.050 inches exposing about 0.050
4 inches of the upper surface of said second dielectric substrate

5 in alignment with said first three-sided gap and said second
6 three-sided gap.

1 17. The reduced size GPS microstrip antenna of claim 15
2 wherein each of said first and second shaped quarter-wavelength
3 microstrip antennas has an overall length of 0.750 inches and
4 an overall width of 0.650 inches.

1 18. The reduced size GPS microstrip antenna of claim 15
2 wherein said plurality of copper plated through holes comprises
3 eighteen copper plated through holes.

1 19. The reduced size GPS microstrip antenna of claim 15
2 wherein each of said first and second dielectric substrates has
3 a thickness of approximately .046 inches.

1 20. The reduced size GPS microstrip antenna of claim 15
2 wherein said copper feed for each of said first and second
3 quarter wavelength microstrip antennas corresponds to a 100 ohm
4 input impedance.